DOCUMENT RESUME

ED 044 484 VT 011 092

TITLE	The Potential Transfer of Industrial Skills from Defense to Nondefense Industries. Volume 1.
INSTITUTION	California State Dept. of Employment, Sacramento.
SPONS AGENCY	Arms Control and Disarmament Agency, Washington, D.C.
REPORT NO	ACDA-E-102
PUB DATE	Apr 68
NOTE	76p.
EDRS PRICE	EDRS Price MF-$0.50 HC-$3.90
DESCRIPTORS	*Aerospace Industry, *Job Analysis, Relocation, *Skill Analysis, Surveys, *Transfer of Training, Vocational Retraining

ABSTRACT

Because of lack of knowledge of specific occupations in defense production, assessment of the impact of defense cutbacks on the economy has been difficult. This project was undertaken to determine which skills of industrial workers in missile production are transferable to nondefense industries and to anticipate manpower problems involved in mass layoffs of these workers, in order to help formulate retraining and other programs designed to help workers adjust to cutbacks. Based on a survey of employers in related nondefense occupations, 35 defense jobs were grouped according to transferability. The study found a high degree of skill transferability, with the limiting factors being manpower needs, wage differentials, hiring practices, union regulations, and federal licensing requirements. Recommendations were made for continued research, increased training opportunities, standardized job classifications, and utilization of defense plant administrative personnel to determine skill similarities. The technical appendix is available as VT 011 093 in this issue. (BH)

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APRIL, 1968

ED0 44484

THE POTENTIAL TRANSFER OF INDUSTRIAL SKILLS FROM DEFENSE TO NONDEFENSE INDUSTRIES

ACDA/E-102 Volume I

PREPARED FOR

The U.S. Arms Control
and Disarmament Agency

PREPARED BY

State of California
Department of Employment

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PREFACE

The California State Department of Employment serves as the community manpower agency and as such is vitally concerned with development and stabilization of employment; with the skill level of the work force; with the effects of automation and technological changes; with alleviating the impact of mass layoffs; and with measures designed to correct imbalances between labor supply and demand.

This Department has been faced with challenges in each of these areas and will continue to be called on to provide manpower services necessary to cope with these situations. In this context the Department of Employment was especially pleased to have had the opportunity to conduct this Special Skills Transfer Study for the U. S. Arms Control and Disarmament Agency.

It is our sincere wish that the findings and recommendations brought forth in this report will assist in the development and assessment of manpower policies to cope with the eventuality of declining defense expenditures.

PETER WEINBERGER
DIRECTOR

ACKNOWLEDGEMENTS

This study was conducted by the California State Department of Employment in Sacramento, California. Mr. Geoffrey Faux and Mr. John Cambern of the United States Arms Control and Disarmament Agency in Washington, D.C., were the Project Officers responsible for this study.

The California State Department of Employment personnel directly involved with this study included Mr. Jerome S. Harris, State Supervisor, Placement Services Group, and Mr. Kenneth L. Maxwell, Supervisor, Employment Outlook Group, who provided administrative guidance to the project staff.

The study was conducted under the direct supervision of Mr. Tomio Masaki, Supervisor, Defense Skills Transfer Project. The project staff consisted of Mr. William M. Grannell, Associate Research Analyst, who developed the labor market data, and Mrs. Diane M. Arellano, and Mr. Edward J. Hoefling, Occupational Analysts, who prepared the job analysis and job relationship data.

The project staff is indebted to Mr. Leon Lewis, Chief, Branch of Occupational Analysis, U.S. Employment Service; Mr. Jack Newman, formerly of that branch; and Mr. Kenneth J. Bohn, Supervisor, Los Angeles Occupational Analysis Field Center, for their technical assistance. In addition, we are grateful to a number of officials of the Aerojet-General Corporation and Lockheed Missiles and Space Company whose knowledge enhanced the project.

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I. GLOSSARY OF TERMS

The following definitions explain some of the terms used in this report. They are listed here alphabetically rather than as footnotes to the text, and apply wherever used in the report. Some of these definitions pertain only to this study.

Aptitude	Specific capacities and abilities required of an individual in order to learn to perform adequately a task or job duty. (See: Worker Traits)
Barriers to Skills Transfer	Considerations which might prevent transfer of a person from a defense job to a similar job in another firm. Long-run employment prospects; wages more than 15 percent below the related defense job; length of retraining; and company hiring practices are conditions which might prove to be barriers to skills transfer.
Company Job Description	A job description prepared by the defense plant in which the job was studied.
Counterpart Occupation	An occupation which was determined to be similar to an analyzed defense-related occupation in terms of job duties; machines, tools, equipment, and work aids used; and basic knowledge, skills, and training required.
Defense-Oriented Industry	One of a group of industries primarily dependent on government sponsored military or aerospace contracts. For purposes of this study, the group includes those industries defined as defense-oriented by the 1963 U. S. Department of Commerce special report, "Shipments of Defense-Oriented Industries"; plus

	"Research and Development" and "Federal, Department of Defense Civilian."
Defense-Related Industry	A broader classification than defense-oriented, including any industry which is largely dependent upon government-sponsored military or aerospace contracts, or which is likely to be adversely affected should cutbacks in these activities occur.
Derived Code	A 6-digit numerical code based upon a detailed job analysis and assigned by an Occupational Analyst to an occupation not found in the Dictionary of Occupational Titles.
D.O.T. Titles	Titles assigned to jobs listed in the Dictionary of Occupational Titles. Job titles are generally assigned based upon common usage.
Environmental Conditions	Those elements, such as temperature, humidity, noise, etc., which may be part of a worker's physical surroundings. (See: Worker Traits)
Formal Company Training	Training of a formal nature in a classroom environment. The subject matter of this training includes topics directly related to the worker's job.
General Educational Development (G.E.D.)	Those aspects of education (formal and informal) which contribute to the worker's (a) reasoning development and ability to follow instructions, and (b) acquisition of "tool" knowledges, such as language or mathematical skills. (See: Worker Traits)
INA	"Information Not Available".

Industrial Designation	A part of the D.O.T. job title indicating the industry or industries in which that job is found.
Job Combination	A defense job and its counterpart occupation which were matched by using the technique of job analysis.
Job Analysis Schedule	A document used to record job information.
Job Outlook	The rating, given in this study, to measure the employment prospects over the forecast decade for a surveyed counterpart occupation. Ratings assigned are "good", "fair", "poor", "indeterminate", or "INA". A more detailed account of these ratings may be found in the initial part of Technical Appendix A.
Labor Force	The labor force consists of all persons employed, unemployed, and involved in labor-management disputes.
Labor Market Area	A geographical area that corresponds with the definition of a standard metropolitan statistical area adopted by the Bureau of the Budget.
Labor Market Outlook	This term refers to the economic prospects for either an occupation or an industry. Employment prospects are the most frequently used measurement, but wages, working conditions, production, and technological developments may also be a consideration.
O.J.T. (On-the-Job Training)	Training of an informal nature while performing the work itself, usually under the close supervision of a qualified journeyman worker.

Primary Industry	The industry defined in the Standard Industrial Classification Manual in which workers in counterpart occupations are most likely to be employed. Primary Industries are used in this survey as a means of establishing mutually exclusive industrial categories for grouping occupations surveyed.
SIC Code	The classification of establishments by type of activity in which engaged, designed to cover the entire field of economic activities as defined in the Standard Industrial Classification Manual.
Specific Vocational Preparation	The amount of time required to learn the techniques, acquire information, and develop the facility needed for average performance in a specific job-worker situation. (See: Worker Traits)
Suffix Code	A 3-digit number added to the code listed in the Dictionary of Occupational Titles code and used to distinguish among jobs having identical 6-digit D.O.T. Codes.
Staffing Schedule	A document used in planning a plant study which shows the occupational composition patterns of that plant.
Temperament	Worker characteristics which an occupation requires. (i.e., situations involving frequent change, dealing with people, working under stress, etc.) (See: Worker Traits)
Validation	Employer corroboration of skills transfer possibilities inherent in a particular job combination based on his comparison of the respective job descriptions shown on the survey schedule.

Volume Occupation	A surveyed occupation in which responding employers, in the aggregate, indicated employment of more than 100 workers.
Worker Traits (Ratings)	Those abilities, personal traits, and individual characteristics required of a worker in order to achieve acceptable job performance. They include training time, aptitudes, interests, temperaments, physical demands and environmental conditions.

II. INTRODUCTION

A. Purpose of Project

At present little is known of the specific occupations in defense production, particularly in the production of complex weapons such as missiles. Knowledge of the similarities and differences between skills used in defense and nondefense production is essential in assessing the likely impact of reduced defense expenditures on the economy. This information is important in formulating retraining and other programs designed to help workers adjust to cutbacks. The primary purposes of this study are to gain insight into the extent to which skills of industrial workers in the production of missiles are potentially transferable to nondefense industries and to anticipate manpower problems involved in mass layoffs of these workers. A secondary objective of the study is to develop a model that may be used for similar studies in other industries.

Ultimately, the findings and recommendations of this and other studies probing the potential impact of cutbacks in defense spending, will assist in the formulation of manpower policies which can be most effective in facilitating economic adjustment under given conditions. If, for example, a major obstacle to skills transfer proves to be the extent and nature of retraining required, a strong training emphasis would necessarily characterize any effective program of labor market adjustment.

On the other hand, if skills transfer from defense to nondefense occupations is found to present no problem, it would be an indication that the emphasis might be better placed on such considerations as income maintenance, relocation of human resources, and community redevelopment. It is recognized that transferability of skills is just one factor affecting the mobility of a given worker, but it is an important one and this study represents an attempt to isolate it and weigh its implications.

This study was conducted by the California State Department of Employment under a contract with the U.S. Arms Control and Disarmament Agency. Technical assistance was provided by the U.S. Employment Service. Two plants in California concerned with the manufacture of missiles were selected by USACDA for study. One of these plants, Aerojet-General Corporation in Sacramento, manufactures rocket engines for the United States space program and rocket engines and missile parts for national defense. The other plant, Lockheed Missiles and Space Company in Sunnyvale, is engaged in the development of missile frames and reentry systems, their assembly and operational testing; as well as the development of space vehicles.

Studies designed to assess the impact of reduced defense spending on laid-off workers have been conducted by various state agencies and research groups under contract to the U.S. Arms Control and Disarmament Agency. For example, the Dyna-Soar Contract Cancellation study, jointly financed by the Department of Defense and ACDA, dealt with determining the effects of the cancellation of a contract that Boeing Company of Seattle had with the Department of Defense to build the Dyna-Soar, a manned maneuverable space vehicle.[15]* The Dyna-Soar study analyzed the reemployment experiences of 5,229 laid-off workers.

Another study which dealt with the same type of problem was the Martin Company Employees -- Reemployment Experiences.[33] The Martin study was undertaken to develop information on the reemployment experiences of a sample of 4,000 workers laid off in 1964 at the Martin Company plant in Denver, as the result of shifting emphasis in the national defense program.

A third study dealing with the same general problem area was conducted in two parts. The first part, Post Layoff Experiences - - Republic Aviation Workers explored the reemployment experiences of some 10,000 workers laid off at the Republic Aviation Corporation in New York.[40] The second part of that study, Job Relationships Between Defense and Nondefense Occupations - - A Study of Aircraft Manufacturing Occupations examined the relationship of defense jobs to nondefense jobs in order to provide assistance in the transfer of workers when cutbacks in defense spending result in substantial layoffs.[27]

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* This and all subsequent bibliography references in this report are designated by a reference number keyed to the bibliography beginning on page 69.

Whereas all three of the studies mentioned dealt with the post-layoff experiences of specific workers, the current study was concerned with the identification of skill requirements for the technical, skilled, and semiskilled workers still employed in defense and the transferability of their skills to nondefense industries.

This study by the California Department of Employment was an extension of the pioneering efforts of the New York agency in the second part of the Republic study.[27] The two studies differed in that the Republic study was made in the context of a specific Employment Service operation of finding jobs for those who were then unemployed. Therefore, the objective of that study was to find the closest related nondefense job for each defense occupation rather than attempting to measure the extent of transferability by grouping defense occupations according to their similarity to nondefense occupations.

The two studies differed also in that the Republic study did not identify the number of workers involved in the various groups of defense occupations; no analysis was made of the retraining implications of the defense-nondefense relationships established; labor market data for the identified nondefense jobs were not obtained; and for practical purposes, wage data was not collected.

This study was similar to that of the Republic study in the basic techniques applied. The specific defense to nondefense skill relationships developed in the Republic study were not used in this study because aircraft manufacturing occupations covered at Republic could not be related to the missile production occupations. Also, some difficulty would have been encountered in attempting to relate the Republic study information to this study because different editions of the Dictionary of Occupational Titles,[14] were used.

B. Scope of Study

The focus of this project was limited to analysis of technical and production occupations. Administrative, scientific, and engineering occupations were not considered because factors other than skill relationship are more significant in determining transferability of workers in these occupations. Furthermore, considerable information is already available about the transfer patterns of workers in administrative, and scientific and engineering occupations.

Clerical, service, and sales occupations, were also excluded from consideration. Skills in these occupations are assumed to be readily transferable to their counterparts in the nondefense sector of the economy on the basis of the known similarities of duties involved. Unskilled occupations were likewise excluded. Workers transferring from one unskilled job to another seldom require formal retraining because duties performed involve such low levels of complexity. Moreover, if formal training is required, it is usually of short duration, rarely over two weeks.

Skilled and technical workers, however, present a different kind of problem in that they have acquired skills at a relatively high level of complexity and are relatively well paid. In a mass layoff situation, both factors affect the transfer potential of these workers.

A related phase of this study involved identifying any significant traits or characteristics of defense occupations affording clues to transferability. A study based on two defense establishments cannot be representative of the entire defense industry, but it can provide a gauge of the uniqueness, if any, of selected defense-related occupations, and a model for subsequent studies in this and other industries.

The long-run labor market outlook for the identified counterpart occupations was a subject of inquiry. This appraisal was significant because skill transfer potential cannot exceed the demand for laid-off workers in the nondefense sector.

The defense occupations which offered good prospects for transfer to counterpart occupations were identified. Other defense occupations were grouped separately if they confronted barriers to transfer because of factors associated with their counterparts, such as lower wages, poor labor market outlook, and union hiring restrictions.

This report (Volume I) describes the methodology, findings, and conclusions of the study. The raw data and worktables are included in a separate volume (Volume II).

C. General Background on Defense Related Employment

California's current defense industry has its roots in aircraft production. From the tiny plant which provided Lindbergh's Spirit-of-St. Louis, facilities for aircraft production mushroomed into giant factories like that which produced the B-24 Liberator -- used so effectively by the 8th Air Force in its saturation raids over Hitler's Third Reich during World War II. From such plants have evolved California's present day aerospace complex which has placed it again in the forefront of states most concerned with national defense. With 9 percent of the nation's nonagricultural employment, California has 16 percent of the nation's employment in defense-oriented industries. The state's aerospace industries averaged 255,000 workers in 1965, nearly a third of the nation's total for this group.

In addition to prime contractors, there are an impressive number of subcontractors -- some almost exclusively involved in defense work. Therefore, cutbacks in defense spending would have far reaching effects on the California economy.

A higher proportion of professional and technical workers are found in aerospace industries as compared to industry as a whole, while at the lower end of the skill ladder, there are relatively less workers.[30] The disproportionate number of workers with higher skill requirements in the aerospace industry is partially caused by the extensive research and development activities involved.

III. SUMMARY

A. Chronology

To accomplish the project objective of determining the extent to which skills of workers presently employed in missile production are transferable to nondefense activities, the project was divided into two broad stages; (1) preparing job analysis schedules for occupations which were unique to defense activities and determining their counterparts in other industries; and (2) soliciting an expression of opinion from a purposive sample of employers, about the comparability of the defense occupation and its imputed counterpart, and about the long-run labor market outlook for these counterpart occupations.

The first stage, which began in May, 1966, consisted of reviewing company job descriptions and conferring with plant officials in order to identify those occupations peculiar to defense activities, and additionally those where the sheer number of workers involved could present a transfer problem. The uniqueness of the occupation was inferred when the job duties ascribed were found to be inexorably associated with a particular phase of defense production. In the process, a large number of staff or support occupations were readily eliminated from consideration. Heavily populated occupations were easily identified from staffing schedules.

The analysis of the defense occupations began in June, 1966 and was accomplished by on-the-site observation wherever possible, and by interviewing company officials. The process of analysis involved applying the techniques used to prepare job definitions for the Third Edition of the Dictionary of Occupational Titles.[14] To insure they were factual the accumulated data were reviewed by company officials. They were then compared with job definitions in the D.O.T. to relate them to jobs which were similar in duties and machines, tools, equipment, and work aids used, as well as the basic knowledges, skills, and training required. A total of 127 defense occupations were studied and 99 of these were analyzed in detail.

The second stage of the project was an employer survey of selected defense jobs and their counterparts. The survey involved 35 defense jobs out of 127 in the study. During the first quarter of 1967, more than 2,000 survey questionnaires were mailed to 665 California employers who were judged likely to have a significant number of workers employed in counterpart occupations outside the missile production industry. Employers were asked whether they would hire a person performing the duties of the defense job, the number currently and prospectively employed in the counterpart occupation, the wage range in the counterpart occupation, and related questions.

Based on survey responses, defense occupations were grouped according to the degrees of transferability. (See page 51, et seq.) Listed first were the 13 defense occupations found to have greatest transfer potential out of the 35 occupations surveyed. Ten defense occupations with counterparts only in defense-oriented industries were treated separately. There were five defense occupations with transfer prospects limited by the significantly lower wages in counterpart occupations (wages 15 percent or more below those of the corresponding defense occupations). Listed last were the seven defense occupations for which licensing requirements, union restrictions, wage levels, and various combinations of these factors presented barriers to transfer.

B. Conclusions

1. Most defense jobs in this study had counterparts sufficiently similar in skills to permit transfer of workers with little or no additional training.
2. Even when similarity of skills between defense and nondefense occupations indicate potential transferability, the prospect of a worker transferring to a counterpart occupation is contingent on the demand for workers in the counterpart occupation, and such other factors as comparability of wages, union regulations,

specific company hiring practices, and federal licensing requirements. One or more of these limiting conditions was present in connection with three out of four defense occupations surveyed.

3. The majority of the defense occupations surveyed have counterparts for which the employment outlook is "good".

4. The median wage rate for most counterpart occupations was 5 percent or more below the beginning rate of the related defense occupations.

5. Most defense jobs which appear to be unique can be related to counterparts in other industries, if they are broken down into their component duties.

6. Occupations dealing with propulsion systems present more skill transfer problems than do occupations dealing with the fabrication of structural members and electronic circuitry of missiles, because the technology of propulsion systems is unique to the defense industry.

7. The lack of standardized job titles in the defense industry, in itself, poses a barrier to worker transfer.

8. The use of job analysis techniques for ascertaining the transferability of defense skills to counterpart occupations demonstrated its effectiveness in this study. However, when using the survey method to verify results of job analysis, there was a tendency for employers to overstate job requirements.

9. Most job opportunities for workers in counterpart occupations occur in the large metropolitan areas. Therefore, defense workers who are laid off from plants located outside of these areas must be willing to relocate in order to effect transfer.

10. To plan for effective service to the workers involved, including job development and relocation, an agency charged with alleviating the dislocation caused by a cutback in the work force will need detailed job information well in advance of such cutbacks to deal with the complex problems involved in the transfer of workers.

11. In order to effect an efficient transfer of skills, some defense workers must perform a different combination of duties simply because the organizational structure of the nondefense plant often differs from that of a defense plant. A number of employers responded that the occupations identified as the counterpart to the defense occupations were similar to occupations found in their establishment but their occupations had additional duties. These additional duties, however, did not require significantly different skills that would impede the transfer. Where these differences exist, the adjustment to the different combinations of tasks expected of the worker should not be any more difficult for the defense worker than for any prospective applicant seeking the job openings whether the individual has defense or nondefense work background.

C. Recommendations

The following recommendations should facilitate the transfer of workers from defense to counterpart occupations.

Recommendation 1

At a time of mass layoffs, the expertise of the defense plant training staff and/or wage and salary administration personnel should be fully utilized to relate defense occupation duties and skill requirements to nondefense occupations. These individuals are cognizant of such job requirements as skills, education, and training. Therefore, these individuals would be the most qualified to evaluate the similarities or differences between defense and nondefense job requirements.

Recommendation 2

Defense contractors, as a contractual obligation, should classify for purposes other than internal use, all employee positions according to the Dictionary of Occupational Titles. This would eliminate the present confusion created by the proliferation of job titles and facilitate comparison of jobs from plant to plant. Moreover, it would greatly reduce the time required to provide placement, counseling, and referral services to laid-off workers by State Employment Service agencies.

Because of the time necessary to institute this type of system and the problems attendant to it, such as cost factors, acceptance by unions, and degree of specialization and job mix in defense jobs, studies should be initiated as early as possible to determine the feasibility of this system.

Recommendation 3

A continuing study of the occupational composition of the California work force should be instituted and sustained, taking in turn and at consecutive intervals thereafter, a sample of establishments in each major California industry. Essential and timely information on job opportunities and prospects would then be continuously available to support management decisions in manpower matters. This should of course be coordinated with any similar effort at the national level.

Recommendation 4

Further research should be conducted to determine the feasibility of using computer systems to match requirements of defense occupations with those of nondefense occupations to identify counterparts.

Recommendation 5

(1) Legislative or administrative action should be taken to allow states to establish training projects similar to those under the Manpower Development and Training Act of 1962, during periods when there is a need for immediate training, without being required to obtain approval for each individual project.

(2) Further investigation should be made to determine other methods necessary to accelerate training projects at times when a program of immediate, massive retraining is necessary.

IV. CHARACTERISTICS OF OCCUPATIONS COVERED IN STUDY

A. Extent of Coverage

The staffing schedules obtained from each plant revealed that comparison of the relevant occupational structures could only be made in the broad terms of Salaried, Technical and Office, and Factory groupings. The more descriptive classifications, such as Administrative, Scientific and Engineering, Clerical, Skilled, Semiskilled, and Unskilled or comparable D.O.T. categories could not be obtained from available records. The number of occupations and workers employed in these broad categories are as follows:

CLASSIFICATIONS	TOTAL OCCUPATIONS	TOTAL EMPLOYEES
SALARIED (Administrative & professional)	1,088	18,168
TECHNICAL AND OFFICE	504	6,856
FACTORY	546	8,112
Totals	2,138	33,136

The following table shows, by D.O.T. categories (first digit of the six digit numerical code), the extent of coverage by the study and the number of defense workers in the occupations studied.

Table 1. Number of Occupations and Defense Workers in Study.

D.O.T. Category		Number Studied		Number Subjected to Detailed Analysis	
		Occupations	Workers	Occupations	Workers
Total		127	5,615	99	4,629
0 - 1	Profess. Tech., & Managerial	14	635	14	635
5	Processing	10	550	9	531
6	Machine	39	1,333	24	722
7	Bench Work	20	959	19	950
8	Structural Work	40	2,105	29	1,758
9	Miscellaneous	4	33	4	33

Twenty-eight occupations readily matched to counterpart occupations without detailed analysis. Detailed job analysis schedules were prepared for 99 of the 127 occupations included in the study. Six of the 99 occupations were unique to the extent they could not be matched with any counterpart whatsoever.

There were instances in which a single counterpart occupation was found to be the counterpart of two or more defense occupations. A total of 761 job combinations were identified (defense occupations with their related counterparts). The number of different counterpart occupations identified, subtracting duplications, was 501.

The number of occupations in the study was nearly 6 percent of the combined total for both plants. When related to the number in Technical and Office, and Factory classifications only, but excluding Salaried, the proportion was over 12 percent so that more than one out of six workers at these plants was in occupations included in the study. When related to the nonsalaried workers in the Technical and Office, and Factory classifications only, the proportion was nearly 40 percent.

B. Occupations Identified as Having Transfer Potential Without Detailed Analysis

The 28 occupations for which transfer potential was ascertainable without detailed job analysis comprised nearly 4 percent of the work force in the aerospace plants. These were primarily craft-type occupations, such as CARPENTER, PLUMBER, and ELECTRICIAN. They are not ordinarily involved directly in defense production. For example, ELECTRICIANS working in a maintenance capacity at the defense establishment are concerned with servicing the electrical systems of buildings and power supply to machines and equipment rather than fabrication of missile components. Other occupations of this group, however, could not be pegged so easily. As an example, the INSPECTOR, PRECISION GAGE had to be analyzed in great detail before pairing it with similar occupations elsewhere. (See Technical Appendix B for the 28 occupations not subjected to detailed analysis.)

C. Occupations Subjected to Detailed Job Analysis

The 99 occupations selected for detailed analysis, were essentially those having a singular relationship to defense production, as for example, the fabricating, assembling, testing, and inspecting of electronic guidance systems, missile propulsion systems, and missile frames. (See Technical Appendix A for the 93 occupations found to have counterparts in other kinds of production and Appendix C for the 6 occupations which none could be found.)

There were a number of seemingly defense-unique occupations, which turned out to be otherwise. The PLANETARY CABLE STRANDING MACHINE OPERATOR for example, operates a machine that fabricates wire rope or electric cable. Aside from adhering to the rigid standards set by the defense plant, his duties are the same whether the fabricated wire is used in an automobile, missile, ship, or as an electrical component of other devices. Occupations of this type are included in Technical Appendix B.

D. Defense Occupations For Which No Counterpart Could Be Identified

Out of the 99 occupations analyzed, there were six in one plant, for which no relationship with other occupations could be established -- IGNITER FABRICATOR; INSPECTOR, MOTOR PROCESS, SENIOR; MECHANIC, PLASTICS; OPERATOR, SOLID PROPELLANT; PLASTICS FABRICATOR, SENIOR; PROCESSOR, SOLID ROCKET MOTOR "A". (See Technical Appendix C for job descriptions.) These occupations represent 568 workers or under 2 percent of the combined work force of the two plants, but more than 5 percent of the workers at the plant where they were found.

The two most heavily populated of the six occupations, OPERATOR, SOLID PROPELLANT; and PROCESSOR, SOLID ROCKET MOTOR "A", involve relatively low levels of skill. In considering skill level alone, it would appear that there should be no difficulty in transferring these skills. However, the variety and combinations of duties present an obstacle in this case. The procedure of matching the highest skill along with a preponderance of lesser skills failed to disclose the occupations similar enough to meet standards set for this study.

Except for age, it was not possible to identify the personal characteristics of those now employed in these six occupations. The majority were found between the ages 25 and 44. Only one worker was in the "24 and under" age group. The lack of youthful workers, according to company officials, is a consequence of their being the first laid off during reductions in force, for lack of seniority.

Analysis of the trait patterns of aptitude, temperament, interest, general educational development, and specific vocational preparation for these six occupations, indicate that they were not unique to these defense occupations.

If lengthy training should be necessary to expedite the transfer of these workers, they would still have a number of productive years remaining in which to apply the training once acquired.

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The workers in these occupations cannot rely on their defense experience for a competitive advantage when seeking other jobs. Their individual qualifications will have to be carefully analyzed in order to locate the best market for their skills, in the event they are displaced by defense cutbacks from their present assignments.

V. LABOR MARKET OUTLOOK

A. Scope of Labor Market Inquiry

The technique of Occupational Analysis was used to identify more than 700 occupations offering transfer possibilities to aerospace workers who might be displaced in event of reduced defense spending.

A representative group of these counterpart occupations was selected for an employer survey. Each occupation was assigned to an industry category defined by the Standard Industrial Classification Manual.[48] Most occupational titles are associated in the Dictionary with an industry designation, and for some, the job title itself indicates the industry in which such workers are most likely to be found.

After the corresponding industry was identified, California Department of Employment statistical records were entered to select establishments with significant employment in that industry. These sources were supplemented by employer lists used for labor market reports required by the U.S. Department of Labor, by data listed in the California Manufacturers Register [1], and, when other information was lacking, by telephone directory listings.

An appraisal of employment prospects in certain of these counterpart occupations was obtained from employers in the course of the mail survey. Although the basic purpose of the survey was to validate the results of occupational analysis, the questionnaire was designed to elicit relevant labor market information as well.

Altogether, 665 firms were sent a total of 2,060 questionnaires during the first quarter of 1967. The survey accounted for an aggregate employment of 784,000 workers. Eighty percent of the employers returned the questionnaires as requested. Distribution of the sample by primary industry is shown in the table at the end of Technical Appendix J. Employers were selected from a total of 104 detailed industry classifications, grouped within 23 mutually exclusive Primary Industries. (See Technical Appendix I.)

The primary industry grouping serves as the basic framework for the analysis of labor market information. There is a significant amount of published information existing about nearly all these industries. By using this arrangement, current and projected employment figures could be applied, and the effect of reduced military spending on transferability of defense skills to these industries could be assessed. Prior studies of interindustry relationships have demonstrated that all but five of these industries would be relatively unaffected by reduced defense programs if offset by spending in the nondefense sector.[5]

Listings of the 126 surveyed counterpart occupations arranged by primary industry and the corresponding labor market prospects are shown in Technical Appendixes F and G.

B. Employment Prospects for Counterpart Occupations Primarily in Nondefense Industries

1. Job outlook for 79 surveyed counterpart occupations in 18 industries relatively unaffected by cutbacks in defense spending (according to Leontief[5]) is itemized in the following pages, and also in Appendix F. The basis for the job outlook ratings is explained briefly in the Glossary, and in more detail in Technical Appendix A.

2. COUNTERPART OCCUPATIONS WITH GOOD EMPLOYMENT PROSPECTS.

   a. Employers surveyed indicated there were good prospects for 42 out of 79 counterpart occupations surveyed. These are summarized in tabular form in the following table.

   b. Explanation of Column Headings for Tables.
   Col. I, PRIMARY INDUSTRY
   The outlook for this rather large group of occupations is considered in the industry configuration of

nonmanufacturing; durable goods manufacturing; and nondurable goods manufacturing.

Col. II, DEFENSE JOB TITLE AND RELATED DOT CODE:

Self-explanatory.

Col. III, COUNTERPART OCCUPATION TITLE AND CODE:

Self-explanatory.

Col. IV, VOLUME:

Jobs for which the composite survey response indicated current employment of more than 100 workers were identified as volume occupations for purposes of this study. Both here and in Technical Appendix F, the jobs classed as "volume" are identified with a + sign. Those with fewer than 100 workers have a blank in this column.

Col. V, AREAS OF PRINCIPAL JOB OPPORTUNITIES:

For the most part, these are the Standard Metropolitan Areas defined by the Bureau of the Budget. Other comments used are self-explanatory.

TABLE 2. DEFENSE JOBS AND THEIR SURVEYED COUNTERPART OCCUPATIONS HAVING GOOD EMPLOYMENT PROSPECTS – ARRANGED BY (NONDEFENSE ORIENTED) PRIMARY INDUSTRY

I	II	III	IV	V
		COUNTERPART OCCUPATION		
PRIMARY INDUSTRY OF COUNTERPART OCCUPATION	TITLE AND DOT CODE OF DEFENSE JOB	TITLE AND DOT CODE	VOLUME	AREAS OF PRINCIPAL JOB OPPORTUNITIES
a. NONMANUFACTURING				
#1 Construction (SIC 15, 16, 17)	ELECTRICAL TECHNICIAN "A" 824.281	ELECTRICIAN 824.281	+	S.F. Bay, San Jose, Los Angeles, Orange Co.
#12 Air Transport (SIC 45)	COMPONENT TEST MECHANIC, SENIOR 625.281	HYDRAULIC TESTER 621.281	+	Los Angeles, San Francisco
	INSTRUMENTATION SERVICEMAN A 710.281	INSTRUMENT MAN 710.281		"
	ELECTRONICS TECHNICIAN A 828.281	RADIO MECHANIC II 823.281	+	Los Angeles, San Francisco, San Diego
	PAINTER, MISSILE 845.781	PAINTER, AIRCRAFT 845.781	+	"
#13 Communications (SIC 48)	INSPECTOR, ELECTRONIC ASSEMBLY, SENIOR 722.281	INSTRUMENT SHOPMAN 722.281	+	Los Angeles
	ELECTRICAL AND ELECTRONICS INSTALLER 829.381	CENTRAL OFFICE INSTALLER 822.381	+	Los Angeles, San Francisco
	"	CABLE MAN 822.884	+	San Francisco Bay Area, Sacramento and San Joaquin Valley

TABLE 2. DEFENSE JOBS AND THEIR SURVEYED COUNTERPART OCCUPATIONS HAVING *GOOD* EMPLOYMENT PROSPECTS – ARRANGED BY (NONDEFENSE ORIENTED) PRIMARY INDUSTRY

I	II	III	IV	V
		COUNTERPART OCCUPATION		
PRIMARY INDUSTRY OF COUNTERPART OCCUPATION	TITLE AND DOT CODE OF DEFENSE JOB	TITLE AND DOT CODE	VOLUME	AREAS OF PRINCIPAL JOB OPPORTUNITIES
a. NONMANUFACTURING				
#13 Communications (SIC 48) - Continued	ELECTRICAL AND ELECTRONICS INSTALLER 829.381	FRAMEMAN 822.884	+	Los Angeles, Sacramento and San Joaquin Valley
#14 Electric, Gas, and Sanitary Services (SIC 49)	INSTRUMENTATION SERVICEMAN "A" 710.281	GAS-METER PROVER 710.281		Los Angeles, San Francisco
	"	GAS-METER REPAIRMAN 710.281		Los Angeles, San Francisco, San Diego
	"	WATER-METER REPAIRMAN 710.281		All metro. areas
	ELECTRICAL TECHNICIAN "A" 824.281	STREET-LIGHT SERVICEMAN 824.381		Scattered openings in most urban locations
	ROCKET TEST TECHNICIAN "A" 899.381	GAS-MAIN FITTER 862.381	+	All metro. areas
	CONTROL MAN 954.782	PUMP-STATION OPERATOR, WATERWORKS 954.782		Los Angeles and other Southern Calif. municipalities
	"	WATER-TREATMENT-PLANT OPERATOR 954.782		"

TABLE 2. DEFENSE JOBS AND THEIR SURVEYED COUNTERPART OCCUPATIONS HAVING *GOOD* EMPLOYMENT PROSPECTS – ARRANGED BY (NONDEFENSE ORIENTED) PRIMARY INDUSTRY

I	II	III	IV	V
		COUNTERPART OCCUPATION		
PRIMARY INDUSTRY OF COUNTERPART OCCUPATION	TITLE AND DOT CODE OF DEFENSE JOB	TITLE AND DOT CODE	VOLUME	AREAS OF PRINCIPAL JOB OPPORTUNITIES
a. NONMANUFACTURING				
#14 Electric, Gas, and Sanitary Services (SIC 49) - Continued	CONTROL MAN 954.782	SEWAGE-PLANT OPERATOR 955.782		Interior Valley and non-coastal Southern Calif.
#15 Professional Equipment Distribution (SIC 5086)	INSPECTOR, ELECTRONIC SYSTEMS 729.281	X-RAY-EQUIPMENT TESTER 729.281		Los Angeles
#16 Automobile Sales and Service (SIC 55)	ASSEMBLER, GENERAL "A" 806.884	AUTOMOBILE-ACCESSORIES INSTALLER 806.884	+	Los Angeles, San Francisco Bay Area, Orange County, San Diego
#17 Television and Radio Repair (SIC 762)	ELECTRONICS TECHNICIAN "A" 828.281	TELEVISION SERVICE-AND-REPAIRMAN 720.281	+	Los Angeles and San Francisco Bay Area
b. MANUFACTURING – DURABLE GOODS				
#2 Furniture and Fixtures (SIC 25)	MODEL MAKER, EXPERIMENTAL 693.281	CABINET MAKER 660.280	+	Los Angeles, San Francisco Bay Area
#6 Fabricated Metal Products (SIC 34)	MISSILE FABRICATION AND STRUCTURES DEVELOPMENT MECHANIC 804.281	FABRICATOR-ASSEMBLER, METAL PRODUCTS 809.381	+	Los Angeles, San Francisco Bay Area, San Jose
	METAL WORKER, BENCH 804.281	"	+	"

TABLE 2. DEFENSE JOBS AND THEIR SURVEYED COUNTERPART OCCUPATIONS HAVING *GOOD* EMPLOYMENT PROSPECTS – ARRANGED BY (NONDEFENSE ORIENTED) PRIMARY INDUSTRY

I	II	III	IV	V
		COUNTERPART OCCUPATION		
PRIMARY INDUSTRY OF COUNTERPART OCCUPATION	TITLE AND DOT CODE OF DEFENSE JOB	TITLE AND DOT CODE	VOLUME	AREAS OF PRINCIPAL JOB OPPORTUNITIES
b. MANUFACTURING – DURABLE GOODS				
#6 Fabricated Metal Products (SIC 34) – Continued	STRUCTURES ASSEMBLER GENERAL 806.381	FABRICATOR-ASSEMBLER, METAL PRODUCTS 809.381	+	Los Angeles, San Francisco Bay Area, San Jose
#7a Diesel Engine Manufacturing Industry (SIC 3519)	COMPONENT TEST MECHANIC, SENIOR 625.281	DIESEL ENGINE TESTER 625.281		San Francisco, Los Angeles
	"	FUEL INJECTION SERVICEMAN 625.281		Scattered throughout State
#7b Farm Equipment (SIC 3522)	INSPECTOR, ROCKET ENGINE TEST 806.281	MAJOR-ASSEMBLY INSPECTOR 806.381		Central Valley, San Francisco Bay Area, San Jose
#7d Machine Shops (SIC 3599)	JIG AND FIXTURE BUILDER 601.281	MACHINE BUILDER 600.281		Los Angeles
	"	DIE MAKER, BENCH, STAMPING 601.281		Los Angeles
	"	INSPECTOR, TOOL 601.281		Los Angeles, Orange Co.
	MACHINIST, LATHE 609.380	CHUCKING-MACHINE SET-UP MAN 604.380		Los Angeles

TABLE 2. DEFENSE JOBS AND THEIR SURVEYED COUNTERPART OCCUPATIONS HAVING *GOOD* EMPLOYMENT PROSPECTS – ARRANGED BY (NONDEFENSE ORIENTED) PRIMARY INDUSTRY

I	II	III	IV	V
		COUNTERPART OCCUPATION		
PRIMARY INDUSTRY OF COUNTERPART OCCUPATION	TITLE AND DOT CODE OF DEFENSE JOB	TITLE AND DOT CODE	VOLUME	AREAS OF PRINCIPAL JOB OPPORTUNITIES
b. MANUFACTURING – DURABLE GOODS				
#7d Machine Shops (SIC 3599) - Continued	MACHINIST, LATHE 609.380	SCREW-MACHINE SET-UP MAN PRODUCTION 604.380	+	Los Angeles
	MACHINIST-MILLING MACHINE 605.782	SHAPER SET-UP OPERATOR, TOOL 605.782		Los Angeles
	"	GRINDER SET-UP OPERATOR, THREAD 609.782		Los Angeles, San Francisco Bay Area
	"	TAPE-CONTROL MACHINE OPERATOR 609.782		Los Angeles, San Francisco Bay Area
#8 Motor Vehicles (SIC 371)	PRECISION ASSEMBLER 806.781	INTERNAL COMBUSTION ENGINE SUBASSEMBLER 706.781	+	Los Angeles, San Jose
	"	INTERNAL COMBUSTION ENGINE ASSEMBLER 806.781	+	Los Angeles, San Jose
	PAINTER, MISSILE 845.781	PAINTER, SPRAY I 741.884	+	Los Angeles, S.F. Bay Area, San Jose
	INSPECTOR, ROCKET ENGINE TEST 806.281	INTERNAL COMBUSTION ENGINE INSPECTOR 806.281	+	Los Angeles, San José

TABLE 2. DEFENSE JOBS AND THEIR SURVEYED COUNTERPART OCCUPATIONS HAVING *GOOD* EMPLOYMENT PROSPECTS – ARRANGED BY (NONDEFENSE ORIENTED) PRIMARY INDUSTRY

I	II	III	IV	V
		COUNTERPART OCCUPATION		
PRIMARY INDUSTRY OF COUNTERPART OCCUPATION	TITLE AND DOT CODE OF DEFENSE JOB	TITLE AND DOT CODE	VOLUME	AREAS OF PRINCIPAL JOB OPPORTUNITIES
b. MANUFACTURING – DURABLE GOODS				
#9 Trailer Coach Mfg. (SIC 3791)	ASSEMBLER, GENERAL "A" 806.884	METAL HANGER 806.884	+	Los Angeles, Riverside County
#10 Electric Sign Mfg. (SIC 3993)	ELECTRICAL TECHNICIAN "A" 824.281	NEON-SIGN SERVICEMAN 824.281	+	Los Angeles
c. MANUFACTURING – NONDURABLE GOODS				
#3 Chemicals (SIC 28)	CHEMICAL WASTE DISPOSAL MAN 903.883	LIQUID-FERTILIZER SERVICEMAN 906.883	+	Interior Valley, Imperial Valley, other farming areas
#4 Petroleum Industry (SIC 29)	"	TANK-TRUCK DRIVER 903.883	+	Los Angeles
#5 Rubber Mfg. (SIC 30)	PROPELLANT MACHINIST 694.883	RUBBER GOODS CUTTER FINISHER 690.780		Scattered locations

3. COUNTERPART OCCUPATIONS WITH FAIR EMPLOYMENT PROSPECTS.

a. Employers surveyed indicated there would be _fair_ prospects for 12 of the 79 surveyed counterpart occupations in industries relatively unaffected by cutbacks in defense spending. These are summarized in tabular form in the following table. Column headings are the same as for the previous group of tables.

TABLE 3. DEFENSE JOBS AND THEIR SURVEYED COUNTERPART OCCUPATIONS HAVING *FAIR* EMPLOYMENT PROSPECTS – ARRANGED BY (NONDEFENSE ORIENTED) PRIMARY INDUSTRY

I	II	III	IV	V
		COUNTERPART OCCUPATION		
PRIMARY INDUSTRY OF COUNTERPART OCCUPATION	TITLE AND DOT CODE OF DEFENSE JOB	TITLE AND DOT CODE	VOLUME	AREAS OF PRINCIPAL JOB OPPORTUNITIES
a. NONMANUFACTURING				
#1 Construction (SIC 15, 16, 17)	PROPELLANT SERVICEMAN 914.885	CEMENT-PUMP OPERATOR 869.782		San Francisco Bay Area
#14 Electric, Gas, and Sanitary Services (SIC 49)	INSTRUMENTATION SERVICEMAN "A"	INSTRUMENT MECHANIC 710.281		Few scattered openings
	"	METER REPAIRMAN 710.281		Few scattered openings
	"	TIN-CASE-METER REPAIRMAN 710.281		More openings in the largest cities
#17 Television and Radio Repair (SIC 762)	ELECTRONICS TECHNICIAN "A" 728.281	TAPE-RECORDER REPAIRMAN 720.281		A few job opportunities in largest cities
	"	RADIO REPAIRMAN 720.281		A few job opportunities in largest cities
b. MANUFACTURING – DURABLE GOODS				
#7d Machine Shops (SIC 3599)	MACHINIST - LATHE 609.380	TURRET-LATHE SET-UP OPERATOR, TOOL 604.386	+	Los Angeles, San Francisco Bay Area
	"	TURRET-LATHE SET-UP OPERATOR 604.380		Los Angeles

TABLE 3. DEFENSE JOBS AND THEIR SURVEYED COUNTERPART OCCUPATIONS HAVING *FAIR* EMPLOYMENT PROSPECTS – ARRANGED BY (NONDEFENSE ORIENTED) PRIMARY INDUSTRY

I	II	III	IV	V
		COUNTERPART OCCUPATION		
PRIMARY INDUSTRY OF COUNTERPART OCCUPATION	TITLE AND DOT CODE OF DEFENSE JOB	TITLE AND DOT CODE	VOLUME	AREAS OF PRINCIPAL JOB OPPORTUNITIES
c. MANUFACTURING NONDURABLE GOODS				
#3 Chemicals (SIC 28)	CHEMICAL PLANT OPERATOR "A"	PILOT-CONTROL OPERATOR 559.782	+	San Francisco Bay Area, Los Angeles Area
	"	SPECIALTIES OPERATOR 559.782	+	San Francisco Bay Area, Los Angeles Area
	"	UTILITY OPERATOR 559.782	+	Los Angeles Area
#4 Petroleum Mfg. (SIC 29)	PROPELLANT SERVICEMAN 914.885	STATION ENGINEER, MAINLINE 914.782	+	Los Angeles Area

4. COUNTERPART OCCUPATIONS WITH POOR EMPLOYMENT PROSPECTS.

Employers surveyed indicated poor prospects for 15 of the 79 surveyed counterpart occupations in industries relatively unaffected by cutbacks in defense spending. Among this group of jobs are declining occupations which technological advances have rendered obsolete. Several of these are in the petroleum industry. Some are scarce occupations in California for which job opportunities will be limited to replacement of a few existing workers. Other counterparts, such as those which are specialized occupations in synthetic rubber manufacturing, are nonexistent in California.

These 15 occupations are summarized in tabular form in the following table.

TABLE 4. DEFENSE JOBS AND THEIR SURVEYED COUNTERPART OCCUPATIONS HAVING *POOR* EMPLOYMENT PROSPECTS – ARRANGED BY (NONDEFENSE ORIENTED) PRIMARY INDUSTRY

I	II	III	IV	V
		COUNTERPART OCCUPATION		
PRIMARY INDUSTRY OF COUNTERPART OCCUPATION	TITLE AND DOT CODE OF DEFENSE JOB	TITLE AND DOT CODE	VOLUME	AREAS OF PRINCIPAL JOB OPPORTUNITIES
a. NONMANUFACTURING				
#11 Railroads (SIC 40)	PAINTER, MISSILE 845.781	RAILROAD-CAR LETTERER 845.381		Prospects limited to a few replacements only
#14 Electric, Gas, and Sanitary Services (SIC 49)	INSTRUMENTATION SERVICEMAN "A" 710.281	INDUSTRIAL GAS SERVICEMAN 710.281		Few job prospects anywhere in state.
	CONTROL MAN 954.782	GAS PUMPING STATION OPERATOR 953.782		Few opportunities expected anywhere
#16 Automobile Sales and Service Industry (SIC 55)	PAINTER, MISSILE 845.781	PAINTER, AUTOMOBILE 825.781		Los Angeles, San Francisco Bay Area, San Diego
b. MANUFACTURING – DURABLE GOODS				
#7d Machine Shops (SIC 3599)	MACHINIST-MILLING MACHINE 605.782	BROACHING-MACHINE SET-UP OPERATOR 605.782		INA
	MACHINIST-LATHE 609.380	THREADING-MACHINE SET-UP MAN 609.380		
c. MANUFACTURING – NONDURABLE GOODS				
#3 Chemicals (SIC 28)	CHEMICAL PLANT OPERATOR 559.782	ALKYLATION OPERATOR 559.782	+	San Francisco Bay Area, Los Angeles Area

TABLE 4. DEFENSE JOBS AND THEIR SURVEYED COUNTERPART OCCUPATIONS HAVING *POOR* EMPLOYMENT PROSPECTS – ARRANGED BY (NONDEFENSE ORIENTED) PRIMARY INDUSTRY

I	II	III	IV	V
PRIMARY INDUSTRY OF COUNTERPART OCCUPATION	TITLE AND DOT CODE OF DEFENSE JOB	COUNTERPART OCCUPATION		
		TITLE AND DOT CODE	VOLUME	AREAS OF PRINCIPAL JOB OPPORTUNITIES
c. MANUFACTURING – NONDURABLE GOODS				
#3 Chemicals (SIC 28)– Continued	CHEMICAL PLANT OPERATOR 559.782	MAKE-UP MAN 559.782		Los Angeles and San Francisco Bay Area
	"	MVA-REACTOR OPERATOR HEAD 559.782		No jobs in California in this occupation
	"	WASTE-TREATMENT OPERATOR 559.782		Few job opportunities projected for California
#4 Petroleum Mfg. (SIC 29)	CONTROL MAN 954.782	PUMPMAN I 549.782	+	A declining occupation with few projected opportunities
	CHEMICAL PLANT OPERATOR "A" 559.782	CATALYST OPERATOR, GASOLINE 559.782		No increase predicted by respondents
	ELECTRICAL BENCH ASSEMBLER 728.884	ELECTRICAL-LINE SPLICER 728.884		A scarce occupation performed intermittently
	PROPELLANT SERVICEMAN 914.885	LINE WALKER 914.584		A scarce and declining occupation
	"	OIL PUMPER 914.782		A declining occupation in Calif. Few opportunities

5. COUNTERPART OCCUPATIONS WITH EMPLOYMENT PROSPECTS INA.

For the remaining ten counterpart occupations found primarily in nondefense industries, the employer response was too fragmentary to support a rating of job prospects. These are listed in the appropriate tables of Technical Appendix F.

C. Employment Prospects for Counterpart Occupations Found Primarily in Defense-Oriented Industries.

In addition to the 79 occupations already discussed, an additional 47 surveyed counterpart occupations are found primarily in five defense-oriented industries.

Responding employers gave information on the long range employment prospects for counterpart occupations primarily found in these industries. Though employers viewed the outlook as favorable for some counterparts, reduced military spending, with offsetting expenditures in the nondefense sector according to Leontief[5], would have an adverse overall effect on employment in each case.

Job outlook ratings of "indeterminate" were assigned to 35 of these occupations, while prospects for the remaining 12, because of the fragmentary information received, were rated as "INA".

Occupations characterized by indeterminate prospects are listed in the following table. Column headings conform to those in preceding tables.

TABLE 5. DEFENSE JOBS AND THEIR SURVEYED COUNTERPART OCCUPATIONS HAVING *INDETERMINATE* EMPLOYMENT PROSPECTS – ARRANGED BY (DEFENSE ORIENTED) PRIMARY INDUSTRY

I	II	III	IV	V
		COUNTERPART OCCUPATION		
PRIMARY INDUSTRY OF COUNTERPART OCCUPATION	TITLE AND DOT CODE OF DEFENSE JOB	TITLE AND DOT CODE	VOLUME	AREAS OF PRINCIPAL JOB OPPORTUNITIES
a. NONMANUFACTURING				
#24 Research (SIC 7391 & 892)	ANALYST, MATHEMATICAL 020.088-010	OPERATIONS RESEARCH ANALYST 020.088	+	San Francisco Bay Area, San Jose, Los Angeles, Orange, and Santa Barbara Counties
	″	MATHEMATICAL TECHNICIAN 020.188	+	San Francisco Bay Area, San Jose, Los Angeles, Orange County
	DATA REDUCTION SPECIALIST 020.188-022	PROGRAMMER, ENGINEERING AND SCIENTIFIC 020.188	+	San Jose, San Francisco Bay Area, Los Angeles, Orange, and Santa Barbara Counties
b. MANUFACTURING – DURABLE GOODS				
#20 Electronics and related (SIC 36)	ELECTRONIC SYSTEMS RESEARCH TECHNICIAN 003.181-014	ELECTRONIC TECHNICIAN 003.181	+	Los Angeles and San Jose Areas
	INSPECTOR, ELECTRONIC ASSEMBLY, SENIOR 722.281	TESTER, MOTORS AND CONTROLS 721.281		Los Angeles and Orange County Areas
	INSTRUMENTATION TECHNICIAN "A" (TESTING) 828.381	INSPECTOR, SYSTEMS 722.281	+	Los Angeles, Orange County, San Diego, and San Jose Areas
	ELECTRONIC SYSTEMS RESEARCH TECHNICIAN (COMPUTERS) 828.281-022	″		

TABLE 5. DEFENSE JOBS AND THEIR SURVEYED COUNTERPART OCCUPATIONS HAVING *INDETERMINATE* EMPLOYMENT PROSPECTS – ARRANGED BY (DEFENSE ORIENTED) PRIMARY INDUSTRY

I	II	III	IV	V
		COUNTERPART OCCUPATION		
PRIMARY INDUSTRY OF COUNTERPART OCCUPATION	TITLE AND DOT CODE OF DEFENSE JOB	TITLE AND DOT CODE	VOLUME	AREAS OF PRINCIPAL JOB OPPORTUNITIES
b. MANUFACTURING – DURABLE GOODS				
#20 Electronics and related (SIC 36) – Continued	ELECTRONIC SYSTEMS RESEARCH TECHNICIAN (INSTRUM. DEV.) 003.181-014	INSPECTOR, SYSTEMS 722.281		Los Angeles, Orange County, San Diego, and San Jose Areas
	ELECTRONIC SYSTEMS RESEARCH TECHNICIAN 003.181	"		
	ELECTRONICS RESEARCH TECHNICIAN (COMPUTERS) 828.281	ELECTRONICS ASSEMBLER, DEVELOPMENTAL 726.281	+	Los Angeles, Orange Co., San Jose and San Francisco Bay Areas
	ELECTRONICS RESEARCH TECHNICIAN (INSTRUMENTATION DEVELOPMENT) 003.181	"		
	ELECTRONIC SYSTEMS RESEARCH TECHNICIAN 003.181	"		
	INSPECTOR, ELECTRONIC ASSEMBLY 726.384	INSPECTOR, FINISHING 726.384		Los Angeles, Orange County, and San Jose Areas
	"	INSPECTOR, PRINTED CIRCUIT BOARDS 726.384	+	Los Angeles, Orange County, and San Jose Areas

TABLE 5. DEFENSE JOBS AND THEIR SURVEYED COUNTERPART OCCUPATIONS HAVING *INDETERMINATE* EMPLOYMENT PROSPECTS – ARRANGED BY (DEFENSE ORIENTED) PRIMARY INDUSTRY

I	II	III	IV	V
		COUNTERPART OCCUPATION		
PRIMARY INDUSTRY OF COUNTERPART OCCUPATION	TITLE AND DOT CODE OF DEFENSE JOB	TITLE AND DOT CODE	VOLUME	AREAS OF PRINCIPAL JOB OPPORTUNITIES
b. MANUFACTURING – DURABLE GOODS				
#20 Electronics and related (SIC 36) – Continued	ELECTRICAL BENCH ASSEMBLER 728.884	CABLE MAKER	+	Los Angeles, San Diego, and San Francisco Bay Area
	"	MODULE ASSEMBLER 726.884	+	Los Angeles and San Diego Areas
	"	PRINTED-CIRCUIT ASSEMBLER 726.884	+	San Jose Area
	ELECTRONICS TECHNICIAN "A" 828.281	PRODUCTION REPAIRMAN 729.381	+	San Jose, Los Angeles, and Orange County Areas
	INSTRUM. TECH. "A" (TESTING) 828.381 ELEC. SYSTEMS RES. TECH. 828.381 INSPECTOR, ELEC. SYST. 729.281	TESTER, SYSTEMS 729.381	+	Los Angeles, Orange Co., and San Jose Areas

TABLE 5. DEFENSE JOBS AND THEIR SURVEYED COUNTERPART OCCUPATIONS HAVING *INDETERMINATE* EMPLOYMENT PROSPECTS – ARRANGED BY (DEFENSE ORIENTED) PRIMARY INDUSTRY

I	II	III	IV	V
PRIMARY INDUSTRY OF COUNTERPART OCCUPATION	TITLE AND DOT CODE OF DEFENSE JOB	COUNTERPART OCCUPATION		
		TITLE AND DOT CODE	VOLUME	AREAS OF PRINCIPAL JOB OPPORTUNITIES
b. MANUFACTURING – DURABLE GOODS				
#20 Electronics and related (SIC 36) – Continued	ELECTRONICS TECH. "A" 828.281 INSTRUM. TECH. "A" (TESTING) 828.381 ELEC. SYST. RES. TECH. (COMP.) 828.281 ELEC. SYST. RES. TECH. (INSTRUM. DEV.) 003.181 ELEC. SYSTEMS RES. TECH. 003.181	ELECTRONICS MECHANIC 828.281	+	Los Angeles, Orange Co., and San Jose Areas
#21 Aircraft Mfg. (SIC 372)	INSPECTOR, RADIOGRAPHIC 199.381	RADIOGRAPHER 199.381		Los Angeles, San Diego
	COMPONENT TEST MECHANIC SENIOR 625.281	PNEUMATIC TESTER AND MECHANIC 621.381	+	Los Angeles
	MODEL MAKER, EXPERIMENTAL	MODEL MAKER, WOOD 661.380		Los Angeles and San Diego Areas
	PRECISION ASSEMBLER, BENCH 706.781	PRECISION ASSEMBLER, BENCH 706.781	+	Los Angeles, Orange Co., and San Diego
	ELECTRONIC SYSTEMS RESEARCH TECHNICIAN 003.181	ELECTRICIAN, RESEARCH 726.281		Los Angeles, San Diego
	ELEC. SYST. RES. TECH. (INSTRUM. DEV.) 003.181	"		

TABLE 5. DEFENSE JOBS AND THEIR SURVEYED COUNTERPART OCCUPATIONS HAVING *INDETERMINATE* EMPLOYMENT PROSPECTS – ARRANGED BY (DEFENSE ORIENTED) PRIMARY INDUSTRY

I	II	III	IV	V
		COUNTERPART OCCUPATION		
PRIMARY INDUSTRY OF COUNTERPART OCCUPATION	TITLE AND DOT CODE OF DEFENSE JOB	TITLE AND DOT CODE	VOLUME	AREAS OF PRINCIPAL JOB OPPORTUNITIES
b. MANUFACTURING – DURABLE GOODS				
#21. Aircraft Mfg. (SIC 372) – Continued	ELECTRONIC SYSTEMS RESEARCH TECHNICIAN 003.181	ENGINEERING DEVELOPMENT TECHNICIAN 726.281		Los Angeles, Orange Co., and San Diego
	INSPECTOR, ELEC. SYSTEMS 729.281	ELECTRICAL EQUIPMENT TESTER 729.381		Los Angeles
	ROCKET TEST TECH. "A" 899.381	AIRCRAFT MECHANIC, RIGGING AND CONTROLS 801.381	+	Los Angeles
	MECHANIC, DEVELOPMENTAL ROCKET CONTROLS 806.281	ASSEMBLER, AIRCRAFT STRUCTURE AND SURFACE 806.381	+	Los Angeles, San Diego
	ROCKET ENGINE TEST INSPECTOR 806.281	INSPECTOR, ASSEMBLIES AND INSTALLATIONS 806.381	+	Los Angeles, San Diego
	PRECISION ASSEMBLER 806.781	ASSEMBLER-INSTALLER, GENERAL 806.781	+	Los Angeles, San Diego
	"	BENCH MECHANIC, STEEL WELD 806.781		Los Angeles, San Diego
	ASSEMBLER GENERAL, "A" 806.884	PRESSURE SEALER-AND-TESTER 806.884		Los Angeles, San Diego

TABLE 5. DEFENSE JOBS AND THEIR SURVEYED COUNTERPART OCCUPATIONS HAVING *INDETERMINATE* EMPLOYMENT PROSPECTS – ARRANGED BY (DEFENSE ORIENTED) PRIMARY INDUSTRY

I	II	III	IV	V
		COUNTERPART OCCUPATION		
PRIMARY INDUSTRY OF COUNTERPART OCCUPATION	TITLE AND DOT CODE OF DEFENSE JOB	TITLE AND DOT CODE	VOLUME	AREAS OF PRINCIPAL JOB OPPORTUNITIES
b. MANUFACTURING – DURABLE GOODS				
#22 Ship and Boat Building (SIC 373)	ROCKET ENGINE TEST INSPECTOR 806.281	HULL INSPECTOR 806.281		Los Angeles, San Diego, San Francisco Bay Area
	ASSEMBLER, GENERAL "A" 806.884	BOAT OUTFITTER 806.884		Los Angeles, Orange County
	"	BOAT RIGGER 806.884		Orange County, San Diego, and San Jose
#23 Instruments (SIC 38)	INSTRUMENTATION SERVICEMAN "A" 710.281	ELECTRICAL INSPECTOR 710.281		San Jose, San Diego, and Orange County
	"	ELECTROMECHANICAL TECHNICIAN 710.281		San Francisco Bay, San Diego
	"	ELECTRONIC-SCALE ASSEMBLER & TESTER 710.281		San Jose, Los Angeles, and Orange County
	INSTRUMENTATION TECHNICIAN "A" (TESTING) 828.381	"		"
	ELECTRICAL BENCH ASSEMBLER 728.884	ELECTRONICS ASSEMBLER 726.884	+	San Jose, Los Angeles, San Diego

VI. JOB TRANSFER PROSPECTS FOR DEFENSE OCCUPATIONS

A. Overall Prospects For Transfer

The criteria used to evaluate skills transfer prospects consisted of length of retraining, employment outlook, wages, and company hiring practices. These were considered as barriers only if, for the counterparts, (1) length of retraining was over six months; (2) employment outlook was other than good; (3) wages were 15 percent or more below the related defense occupation; or (4) hiring restrictions, such as union regulations, company hiring practices, and federal licensing requirements existed. Since these factors were rated largely on the basis of response to the survey questionnaire, only the job combinations surveyed are considered here.

1. Defense Occupations With No Barriers To Job Transfer

The following 13 defense occupations, out of the 35 occupations surveyed, were found to satisfy all criteria for job transfer:

Processing Occupations

The CHEMICAL PLANT OPERATOR "A" would not likely have difficulty in transferring to UTILITY OPERATOR in the chemical industry. Wages for UTILITY OPERATOR are higher than in the defense occupation. The labor market rating of "fair" for UTILITY OPERATOR is not regarded as a barrier since this is a volume occupation.

Machine Trades Occupations

The COMPONENT TEST MECHANIC, SENIOR was found to have good transfer prospects to the HYDRAULIC TESTER in the air transportation industry and the DIESEL-ENGINE TESTER in the engine and turbine industry. Both of these occupations have comparable wages and the employment outlook is good. In addition, the HYDRAULIC TESTER is a volume occupation.

The JIG AND FIXTURE BUILDER, is transferable to INSPECTOR, TOOL in the machine shop industry and MACHINE BUILDER in the machine manufacturing industry. Both counterpart occupations have comparable wages and good employment outlook.

The MACHINIST, LATHE has good transfer prospects to the CHUCKING-MACHINE SET-UP MAN and the SCREW-MACHINE SET-UP MAN, PRODUCTION in the machine shop industry. Both of these occupations have wages comparable to the defense occupation and have good employment outlook.

MACHINIST, MILLING MACHINE is transferable to the GRINDER SET-UP OPERATOR, THREAD in the machine shop industry. This counterpart occupation has a comparable wage level and a good employment outlook.

Bench Work Occupations

The INSTRUMENTATION SERVICEMAN "A" has as its counterpart occupation the INSTRUMENT MAN, found primarily in the air transportation industry. This counterpart occupation has a comparable wage.

Structural Work Occupations

The ASSEMBLER, GENERAL "A" was found to have good transfer prospects to AUTOMOBILE-ACCESSORIES INSTALLER, a volume job in the automotive services industry. This counterpart has a comparable wage rate.

The skills of ELECTRICAL TECHNICIAN "A" seem to be readily transferable to STREET-LIGHT SERVICEMAN, in the light, heat, and power industry. This counterpart occupation has a comparable wage rate and a good employment outlook.

The ELECTRONIC TECHNICIAN "A" has good prospects for transfer to the TELEVISION SERVICE-AND-REPAIRMAN. This counterpart is a volume occupation.

The INSPECTOR, ROCKET ENGINE TEST has transfer possibilities to the MAJOR-ASSEMBLY INSPECTOR in the agricultural equipment industry; and the INTERNAL-COMBUSTION-ENGINE INSPECTOR in the engine and turbine industry. The latter counterpart is a volume occupation.

The PAINTER, MISSILE has both the PAINTER, SPRAY I and the PAINTER, AIRCRAFT, found primarily in the air transportation industry as its counterparts. Both occupations are volume occupations with a good employment outlook.

The PRECISION ASSEMBLER is transferable to the INTERNAL-COMBUSTION-ENGINE ASSEMBLER in the engine and turbine industry. The counterpart is a volume occupation with good employment outlook.

The ROCKET TEST TECHNICIAN "A" is transferable to the GAS-MAIN FITTER in the light, heat, and power industry. The counterpart is also a volume occupation with good employment outlook.

2. Defense Occupations Which Have Counterpart Occupations In Defense-Oriented Industries Only

Defense jobholders in the five technical occupations surveyed would likely have difficulty in transferring their skills because all counterparts were in defense-oriented industries, such as electronics, research, and aircraft.

In all there were 10 defense occupations including the technical classifications, whose counterparts were identified with defense-oriented industries in this study. These occupations are:

Technical Occupations

ELECTRONIC SYSTEMS RESEARCH TECHNICIAN (INSTRUMENTATION DEVELOPMENT); ELECTRONIC SYSTEMS RESEARCH TECHNICIAN; ANALYST, MATHEMATICAL; DATA REDUCTION SPECIALIST; INSPECTOR, RADIOGRAPHIC.

Processing Occupations

METALIZER, PLASMA ARC

Bench Work Occupations

INSPECTOR, ELECTRONIC ASSEMBLY

Structural Work Occupations

MECHANIC, DEVELOPMENTAL ROCKET CONTROLS; ELECTRONIC SYSTEMS RESEARCH TECHNICIAN (COMPUTERS); and INSTRUMENTATION TECHNICIAN "A" (TESTING).

Length of training required and wage level are not a hindrance in most cases. The likely impact of defense cutbacks is the critical factor here.

3. Defense Occupations With Transfer Prospects Adversely Affected By Wage Level in the Counterpart Occupation

The following defense occupations have good prospects for transfer except for the fact that the counterpart occupations have wages 15 percent or more below those of the corresponding defense occupations:

PROPELLANT MACHINIST; MISSILE FABRICATION AND STRUCTURES DEVELOPMENT MECHANIC; METAL WORKER, BENCH; STRUCTURES ASSEMBLER, GENERAL; and ELECTRICAL AND ELECTRONICS INSTALLER.

While the median rate for a counterpart occupation which differed by 5 percent or more in either direction from the scale for the defense occupation was considered significantly different, only those rates which were 15 percent or more below those of the related defense occupations were regarded as genuine barriers to job transfer for purposes of this study.

The level of wages acceptable to a laid-off defense worker has been shown by other studies to be subject to a variety of considerations.

For example, the Martin Company Employees Reemployment Experiences study found that defense workers lowered their wage demands below what they had been making at Martin, as the length of their unemployment increased.[33] The Martin study also clearly pointed out that the average drop in wages incurred as a result of layoff from a defense plant varied depending on whether the workers were in the professional or nonprofessional group. The Dyna-Soar Contract Cancellation study indicated that wage demands varied according to the workers' willingness to move out of the area in which he resided while employed at the defense establishment.[15] As would be expected, most workers wanted more money if they were to move elsewhere. However, the money desired as an incentive to move elsewhere decreased as the number of weeks without work increased. Wage demands of workers laid off as a result of the Dyna-Soar contract cancellation were less than what they had been making if they were at either the lower or higher ends of the age range, had lower educational attainment levels, performed in an occupation that fell in the lower skill levels at the defense plants, or had less familial responsibilities. The study on the Post Layoff Experiences -- Republic Aviation Workers found that under certain conditions, female workers suffered greater loss in pay than male workers.[40]

In contrast to the three aforementioned labor mobility studies sponsored by the U.S. Arms Control and Disarmament Agency, this project did not probe the job mobility of defense workers already laid off. Therefore, wage demands and their effect on transferability of workers could not be assessed utilizing data on experiences of laid-off workers.

4. Defense Occupations With More Than One Barrier To Job Transfer

The following defense occupations have barriers to transfer because the counterparts are affected by various combinations of such factors as union restrictions, poor employment outlook, wages lower by more than 15 percent, and civil service entrance requirements.

Machine Trades Occupations

The counterpart occupations for the MODEL MAKER, EXPERIMENTAL were found to have barriers to transfer because of having lower wages and being in industries which are defense-oriented.

Bench Work Occupations

The INSPECTOR, ELECTRONIC ASSEMBLY, SENIOR and the INSPECTOR, ELECTRONIC SYSTEMS would have job transfer problems because the counterpart occupations either have lower wages or are in defense-oriented industries.

The ELECTRICAL BENCH ASSEMBLER has counterpart occupations which have poor employment outlook or are found only in defense-oriented industries.

Miscellaneous Occupations

The CHEMICAL WASTE DISPOSAL MAN has poor transfer prospects because the counterpart occupations have lower wages or employers state there is a union contract which restricts them from hiring from outside of the company.

The PROPELLANT SERVICEMAN has counterpart occupations with wages that are either comparable or higher, but is limited in transfer prospects because of poor employment outlook. One of these counterpart occupations, STATION ENGINEER, MAIN LINE is a volume occupation and has higher wages but job transfer prospects are limited by union restrictions on hiring.

The CONTROL MAN has counterparts which have poor employment outlook or require passing of civil service examinations.

B. Nature and Extent of Retraining Required

Of the 121 defense occupations analyzed, 77 had one or more counterparts that would not require any additional training to effect skills transfer. Twenty-two of the 121 defense occupations had counterparts for which the training requirement was beyond short demonstration up to and including 30 days. For counterparts of 16 defense occupations, the minimum retraining required was between one and three months. Only six defense occupations had counterparts requiring between three and six months of additional training as a minimum.

Employer responses for the most part confirmed tentative conclusions based on job analysis about the extent of retraining required. Relatively few responses indicated a need for formal company training or apprenticeship as a condition of transfer. This can be attributed either to the similarity between defense and counterpart skills or employer reluctance to accept workers who require extensive training to become productive.

The majority of the responding employers confirmed that training necessary to effect transfer, can be accomplished within six months. Superficially, it would appear that if six to 12 months' training is acceptable for a standard, the list of related counterpart occupations would be greatly extended. This would be the case if comparability of skills is the only criterion for transfer.

C. Comparability of Wages

Approximately 60 percent of the counterpart occupations surveyed have a median starting hourly rate more than five percent lower than that of the defense occupation, according to responding employers. They also indicated that median rates for approximately 30 percent of the counterpart occupations were within five percent or higher. For the remaining job combinations, the information was not complete enough to make a valid comparison.

VII. DESCRIPTION OF PROCEDURE AND GENERAL METHODOLOGY

A. Outline of Approach

The major steps to be followed in conducting the project were first identified to insure an orderly approach toward the project objectives. These major steps consisted of:

1. Preparation of staffing schedule.
2. Identification of defense occupations for study.
3. Job analysis of selected defense occupations.
4. Review of analyses by company personnel.
5. Identification of counterpart occupations.
6. Editorial review of completed job analysis schedules.
7. Survey of selected occupations identified as counterparts.
8. Assessment of the extent of wage differences and the long-run labor market outlook for the counterpart occupations.
9. Classification of defense occupations according to degrees of transferability based on criteria such as length of retraining, labor market outlook for counterpart occupations, and wage differentials.

B. Explanation of Techniques and Procedures

1. Preparation of Staffing Schedule

A preliminary staffing schedule was completed at each plant during the third quarter of 1966 in order to effect a systematic but flexible plan for inventorying and recording information about jobs and workers in the firms. The staffing schedule illustrates the distribution of jobs in each plant process and specifies the number of workers in each job. (See Technical Appendix D for facsimile of staffing schedule.)

2. Identification of Specific Occupations for Study

Because the study was designed to focus on the technical, skilled, and semiskilled occupations, only descriptions for those jobs were reviewed in order to identify jobs which appeared to be defense-unique. The selection criteria used were: (1) the extent to which the job involved duties directly connected with the production of missiles; and (2) the extent to which the duties could not be identified as being performed in nondefense manufacturing. All together, 127 occupations were identified and selected for study.

Detailed job analysis schedules were prepared for the 99 strongly defense-unique occupations in the course of identifying counterparts. These 99 occupations were found in the following D.O.T. categories: Professional, Technical, and Managerial - 14 occupations; Processing - 9 occupations; Machine Trades - 24 occupations; Bench Work - 19 occupations; Structural Work - 29 occupations; Miscellaneous - 4 occupations. These are listed, with their counterpart occupations, in Technical Appendix A.

Twenty-eight additional occupations were included in the study, either because they have defense orientation although of a less positive nature, or because a substantial number of workers are employed in the occupation. Job summaries were prepared directly from company job descriptions in these cases because the nature of the duties was such that counterparts could be identified without detailed analyses. These 28 occupations fell in the following D.O.T. categories: Processing - 1 occupation; Machine Trades - 15 occupations; Bench Work - 1 occupation; Structural Work - 11 occupations. Occupations that did not require detailed job analyses to determine transferability are listed with their related counterparts in Technical Appendix B.

Both defense plants utilize the designations "A" or "Senior", "B", and "C", to identify various levels within an occupation. These designations are used primarily for establishing pay ranges and promotional patterns. To reflect the overall job requirements, it was found that only the top level, "A" or "Senior", of each classification needed to be considered in this study.

Certain occupations occurring in a defense plant, such as MAINTENANCE PAINTER, ELECTRICIAN, and CARPENTER, have skill requirements common to jobs in a variety of industries, and were not considered defense-unique in this study. Review of the company job descriptions indicated that these activities were no different than those performed in a nondefense operation and were considered obviously transferable to nondefense industries.

The Dictionary of Occupational Titles classifies the FOREMAN occupations in the Industrial category. However, FOREMAN occupations were not included in this study because the craft skills they entail were no different from those of the workers supervised. That segment of the foreman's duties involving supervisory responsibilities, such as assigning duties, evaluating job performance, interpreting company policies, and enforcing safety regulations were not considered defense unique.

During the selection of "Technical" occupations for study, it was found that this category included occupations with a wide range of duties and skill levels. In order to identify these occupations in a consistent manner, the following description of the TECHNICIAN as it appears in the Third Edition D.O.T., was utilized:

> TECHNICIAN (profess. & kin.) technical aid; technical assistant. A term applied to a worker who works in direct support of ENGINEERS or SCIENTISTS, utilizing theoretical knowledge of fundamental scientific, engineering, mathematical, or draft design principles. Solves practical problems encountered in fields of specialization such as those concerned with development of electrical, electronic, electromechanical, and hydromechanical devices and mechanisms; application of engineering principles in solving design, development, and modification problems of parts or assemblies for products or systems; and application of natural and physical science principles to basic or applied research problems in fields, such as metallurgy, chemistry, and physics. May specialize in working with ENGINEERS and be designated ENGINEERING AID. Classifications are made according to specialization as ELECTRONIC TECHNICIAN; MATHEMATICAL TECHNICIAN.

The TECHNICIAN occupations at both plants are characterized by the specialized skills that they require beyond basic knowledge in various disciplines. The area of knowledge required depends on the section or project to which the worker is assigned. The companies hire individuals with basic educational backgrounds in such areas as physics, chemistry, or mathematics and train them to perform various specialties.

Because the companies feel that workers with the necessary broad background can be trained to perform any of the specialties within that occupational group, it was not realistic to consider each specialty as a specific occupation.

3. Analysis of Selected Defense Occupations

Standard job analysis schedules and physical demands forms were utilized to document pertinent information on the selected defense occupations. (See Technical Appendix D for discussion and facsimile of forms.) These forms were used to obtain job data for the third edition of the Dictionary of Occupational Titles. Since the D.O.T. was used as our primary source of information on counterpart occupations, it appeared logical to obtain and compile our data according to this format to insure comparability.

Information for the job analysis schedules and physical demands forms was obtained by reviewing company job descriptions, interviewing workers performing the duties of the jobs being analyzed, interviewing wage and salary administration personnel, or any combination of these methods deemed feasible at the time. This activity was conducted during the third and fourth quarters of 1966. Because of the classified nature of the defense activities involved, the project staff did not have access to actual work sites in many instances. However, in all cases it was possible to interview wage and salary administration personnel to supplement company job descriptions or information obtained directly from the workers.

4. Review of Accumulated Data by Company Personnel

Job analysis schedules and physical demands forms were prepared in draft form and returned to appropriate company representatives for review. This review accomplished two objectives:

a. Insured agreement on descriptions of the duties performed.

b. Avoided disclosure of confidential information.

After the company review, any necessary additions, deletions, or changes, were made.

5. Identification of Counterpart Occupations

Identification of counterpart occupations consisted primarily of comparing job analysis information on defense jobs with job information in the Dictionary of Occupational Titles to ascertain similarities. Descriptions in the D.O.T. were reviewed to identify those jobs which reflected similarities in job duties, and machines, tools, equipment, and work aids used, as well as the basic knowledges, skills, and training required. The counterpart occupations identified at this phase of study were occupations for which the duration of transitional training was estimated not to exceed six months. Retraining time was the occupational analysts' evaluation of the minimum retraining required to effect skills transfer, based on comparison of the tasks involved in the defense and counterpart occupations and consideration of the variations in these tasks.

The period of six months as a criterion was arrived at as a compromise between three months which seemed unduly restrictive on the number of potential counterparts, and one year, which would be too expensive unless employers were given some assistance in the form of subsidies or workers were given institutional training sponsored by the Government.

6. Editorial Review of Completed Job Analysis Schedule

Drafts of completed job analysis schedules, including lists of related counterpart occupations, were reviewed and edited by the Project Supervisor. Copies of the schedules were sent to the United States Bureau of Employment Security, Division of Technical Development, and the Occupational Analysis Field Center of the California Department of Employment in Los Angeles, for further technical review. All comments and suggestions for modification or revision of the data were considered and appropriate editorial changes incorporated in the final schedules.

7. Survey of Occupations Identified as Counterparts

As an intrinsic part of the study, a mail survey of selected employers was conducted for the purpose of verifying certain tentative conclusions about the nature of relationships existing between the defense occupations analyzed and their counterparts.

Since the cost of a survey covering every job combination would have been prohibitive, not all the jobs analyzed were surveyed. Of the 99 defense occupations analyzed in detail, 35 were selected for validation by mail survey. For these 35 occupations, a total of 126 different counterparts were identified by occupational analysis. During the first quarter of 1967, more than 2,000 survey questionnaires were mailed to 665 California employers deemed likely to have significant numbers of workers on the payroll in counterpart occupations. Questionnaires were returned by 530 of these employers, 80 percent of the number surveyed. Technical Appendix J provides a detailed explanation of the techniques used to select employers in the survey, as well as a facsimile of the survey questionnaire and its transmittal letter.

8. Identification of Wage Differentials and Long-Run Labor Market Outlook

Since level of pay was regarded as a critical factor in job transferability, the survey included provisions for obtaining pertinent wage data.

Median starting rates were used as a basis of comparison. These are a statewide composite of the entire sample for the counterpart occupation, disregarding purely local differences. The median hourly rate derived from completed survey schedules was compared with the starting hourly rate for the defense occupation. If the rate for the counterpart occupation fell within 5 percent on either side of the rate for the defense occupation, the wage disparity was categorized as "No Significant

Difference". Any counterpart wage found to be outside this range was identified as being "Lower" or "Higher", as appropriate. (See Technical Appendix A.)

For purposes of this study the wage level was considered as a barrier to job transfer when the median rate for the counterpart occupation fell short of the analogous rate for the defense occupation by 15 percent or more.

Labor market outlook for the identified counterpart occupations, including the identification of the localities of greatest demand for these occupations was an essential element in this study. In the absence of available projections for occupations under study, employers were asked to estimate the number of workers they expected to have in designated occupations by 1970 and 1975.

9. Classification of Defense Occupations According to Degrees of Transferability

In order to arrive at an overall evaluation of the job transfer prospects for the defense occupations studied, it was necessary to investigate the transfer prospects of a defense occupation to each of its identified counterparts. Each defense occupation generally had two or more counterpart occupations. The labor market prospects, wage level, and other factors which directly affect transferability were not necessarily the same for the counterpart occupations identified with a specific defense occupation. For example, one counterpart may be limited by poor labor market prospects while another counterpart to the same defense occupation may have good labor market prospects. A defense occupation characterized by at least one counterpart which apparently presented no transfer barriers, was considered as having good transfer potential.

Those defense occupations which had counterparts found only in the primarily defense-oriented industries of electronics, including computers; aircraft; ship and boat building;

instruments; and research; were treated separately in the analysis. Though some counterparts in these industries had good labor market outlook and higher wages, the transfer prospects are not given a positive rating, as the parent industries would be adversely affected at a time of defense cutbacks (see Section V).

Another category consisted of job combinations in which a lower wage for the counterpart occupation was the only barrier to skills transfer.

The final category of defense occupations consisted of those with a combination of barriers to transfer including such other matters as union contract agreements, company hiring policies, federal licensing requirements, and civil service requirements.

C. Characteristics of the Dictionary of Occupational Titles and Its Use In Identifying Related Counterpart Occupations

The Dictionary of Occupational Titles, third edition, published in 1965, was used as the primary tool for identifying the counterparts to defense occupations selected for study. The D.O.T. is the most comprehensive document available for identification and definition of occupations in the American economy. There are 21,741 separate occupations defined which are known by 13,809 additional titles, making a total of 35,550 titles defined. The D.O.T. reflects relationships among jobs not only in terms of the traditional work performed but also in terms of "worker traits" required. These include training time, aptitudes, interests, temperaments, physical demands, and working conditions.

The uniqueness of this D.O.T. classification structure is its system of grouping occupations having the same basic characteristics. Specifically, occupations are grouped according to such factors as purpose of the job; specific work methods; characteristics of machines, tools, equipment, or work aids used in the job; materials being processed; product being made; knowledge dealt with or applied; types of services rendered; generic title of job; and industry in which the job is found. The system also reflects the comparative level of complexity at which the job requires the worker to function.

For purposes of relating defense occupations to the D.O.T. definitions, the job information developed by the project staff allowed them to assign a D.O.T. numerical classification code to the defense occupation. This code was then used to enter the listing of occupations in that section of the D.O.T. that lists all the occupations in numerical code order. The descriptions of all occupations having the same code as that assigned to the defense job were then reviewed. If the job duties were similar in all significant respects, those occupations were identified as related.

The search for counterpart occupations was not limited to D.O.T. occupations having the same code as that assigned to the defense occupation. Other occupations falling in related occupational code groups were also considered when the level of complexity at which the occupation requires the worker to function as indicated by the last three digits of the D.O.T. code, was reasonably comparable.

Physical demands data were developed for all occupations analyzed. However, with very few exceptions, physical demands did not significantly differ between defense jobs and their counterparts. Therefore, this information was not included for the combination.

The list of related occupations reflected in Technical Appendix A is not intended to be all-inclusive. Time limitations precluded an exhaustive search for related occupations. Therefore, this list is representative at best.

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